



RFLM-961122XC-392

2KW Peak Power ARNS/IFF Limiter Module

Features:

- Frequency Range: 960 MHz to 1,215 MHz
- High Peak Power Handling: +63 dBm
- High Average Power Handling: +53 dBm
- Low Insertion Loss: < 0.7 dB
- Return Loss: > 15 dB
- Flat Leakage @ +63 dBm Input: < 14 dBm
- Low Spike Energy Leakage: < 0.5 ergs
- Ultra Fast Recovery Time: < 1.0 usec
- SMT Limiter Module: 10mm x 6mm x 2.5mm
- DC Blocking Capacitors
- RoHS Compliant

Description:

The RFLM-961122XC-392 SMT Silicon PIN Diode Limiter Module offers “Always On” High Power CW and Peak protection in the Aeronautical Radio Navigation Service (ARNS)/ Identification Friend or Foe (IFF) frequency range of 960 MHz to 1,215 MHz. This Limiter Module is based on proven hybrid assembly technique utilized extensively in high reliability, mission critical applications for several decades. The RFLM-961122XC-392 offers excellent thermal characteristics in a compact, low profile 10mm x 6mm x 2.5mm package. It was designed for optimal small signal insertion loss permitting extremely low receiver noise figure while simultaneously offering excellent large signal protection and exceptionally low Flat Leakage for effective receiver protection in the ARNS/IFF frequency range.

The RFLM-961122XC-392 Limiter Module provides outstanding passive receiver protection (Always On) which protects against High Peak Power up to +63 dBm (Peak), Pulse Width = 10 usec, Pulse Repetition Rate = 5%, $T_{case}=+55^{\circ}C$, while maintaining low flat leakage to less than 14 dBm (typ), and reduces Spike Leakage to less than 0.5 ergs(typ).

ESD and Moisture Sensitivity Rating

The RFLM-961122XC-392 Limiter Module carries a Class 0 ESD rating (HBM) and an MSL 1 moisture rating.

Thermal Management Features

The proprietary design methodology minimizes the thermal resistance from the coarse stage shunt limiter diode junction to base plate. This three stage passive limiter design employs a very sensitive detector circuit which enables ultra-fast turn on of both the intermediate and coarse stages. This circuit topology coupled with the thermal characteristic of the substrate design enables the Limiter Module to reliably handling High Input RF Power up to +53 dBm CW and RF Peak Power levels up to +63 dBm (10 uSec pulse width @ 5.0% duty cycle) with base plate temperature at +55°C. The RFLM-961122XC-392 is based on a substrate designed to offer superior long term reliability in the customer's application by utilizing ultra-thin Au plating to combat Au embrittlement concerns.

Absolute Maximum Ratings

@ $Z_0=50\Omega$, $T_A=+25^\circ\text{C}$ as measured on the base ground surface of the device.

Parameter	Conditions	Absolute Maximum Value
Operating Temperature		-65°C to 125°C
Storage Temperature		-65°C to 150°C
Junction Temperature		175°C
Assembly Temperature	T = 30 seconds	260°C
RF Peak Incident Power	$T_{\text{CASE}}=55^\circ\text{C}$, source and load VSWR < 1.2:1, RF Pulse width = 10 usec, duty cycle = 5%, derated linearly to 0 W at $T_{\text{CASE}}=150^\circ\text{C}$ (note 1)	+63 dBm
RF CW Incident Power	$T_{\text{CASE}}=+55^\circ\text{C}$, source and load VSWR < 1.2:1, derated linearly to 0 W at $T_{\text{CASE}}=150^\circ\text{C}$ (note 1)	+53 dBm
RF Input & Output DC Block Capacitor Voltage Breakdown		100 V DC

Note 1: T_{CASE} is defined as the temperature of the bottom ground surface of the device.

RFLM-961122XC-392 Electrical Specifications

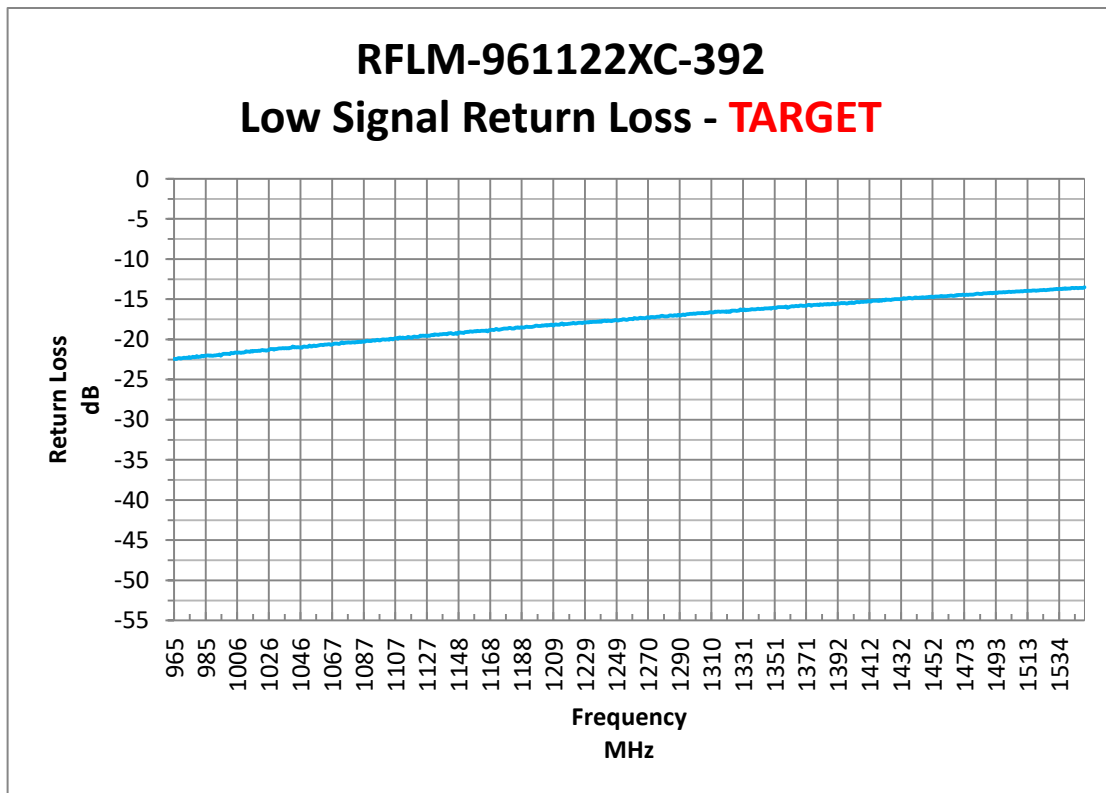
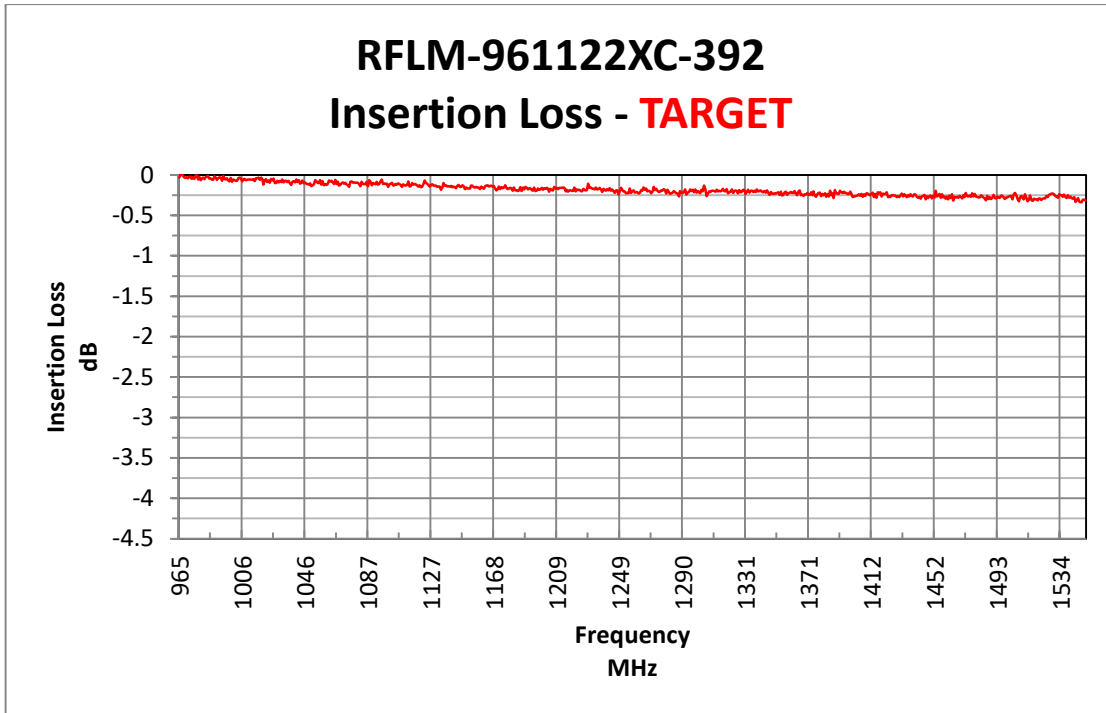
@ $Z_0=50\Omega$, $T_A=+25^\circ\text{C}$ as measured on the base ground surface of the device.

Parameters	Symbol	Test Conditions	Min Value	Typ Value	Max Value	Units
Frequency	F	$960\text{ MHz} \leq F \leq 1,215\text{ MHz}$	960		1,215	MHz
Insertion Loss	IL	$960\text{ MHz} \leq F \leq 1,215\text{ MHz}$, $P_{in} = -20\text{ dBm}$		0.7	0.9	dB
IL Rate of Change vs Operating Temperature	ΔIL	$960\text{ MHz} \leq F \leq 1,215\text{ MHz}$, $P_{in} \leq -20\text{ dBm}$		0.005		dB/ $^\circ\text{C}$
Return Loss	RL	$960\text{ MHz} \leq F \leq 1,215\text{ MHz}$, $P_{in} = -20\text{ dBm}$	15			dB
Input 1 dB Compression Point	$\text{IP}_{1\text{dB}}$	$960\text{ MHz} \leq F \leq 1,215\text{ MHz}$		11		dBm
Peak Incident Power	$P_{inc(PK)}$	RF Pulse = 10 usec, duty cycle = 5% $T_{case} = +55^\circ\text{C}$			+63	dBm
CW Incident Power	$P_{inc(CW)}$	$960\text{ MHz} \leq F \leq 1,215\text{ MHz}$; $T_{case} = +55^\circ\text{C}$			+53	dBm
Flat Leakage	FL	$P_{in} = +60\text{ dBm}$, RF Pulse width = 1 us, duty cycle = 1%			14	dBm
Spike Leakage	SL	$P_{in} = +60\text{ dBm}$, RF Pulse Width = 1 us, duty cycle = 1%			0.5	erg
Recovery Time	T_R	50% falling edge of RF Pulse to 1 dB IL, $P_{in} = +63\text{ dBm}$ peak, RF PW = 10 us, duty cycle = 5%		1.0		usec

Notes:

RFLM-961122XC-392 Typical Performance

$Z_0 = 50\Omega$, $T_{CASE} = 25^\circ\text{C}$, PIN = -20 dBm as measured on the Ground Plane of the device.

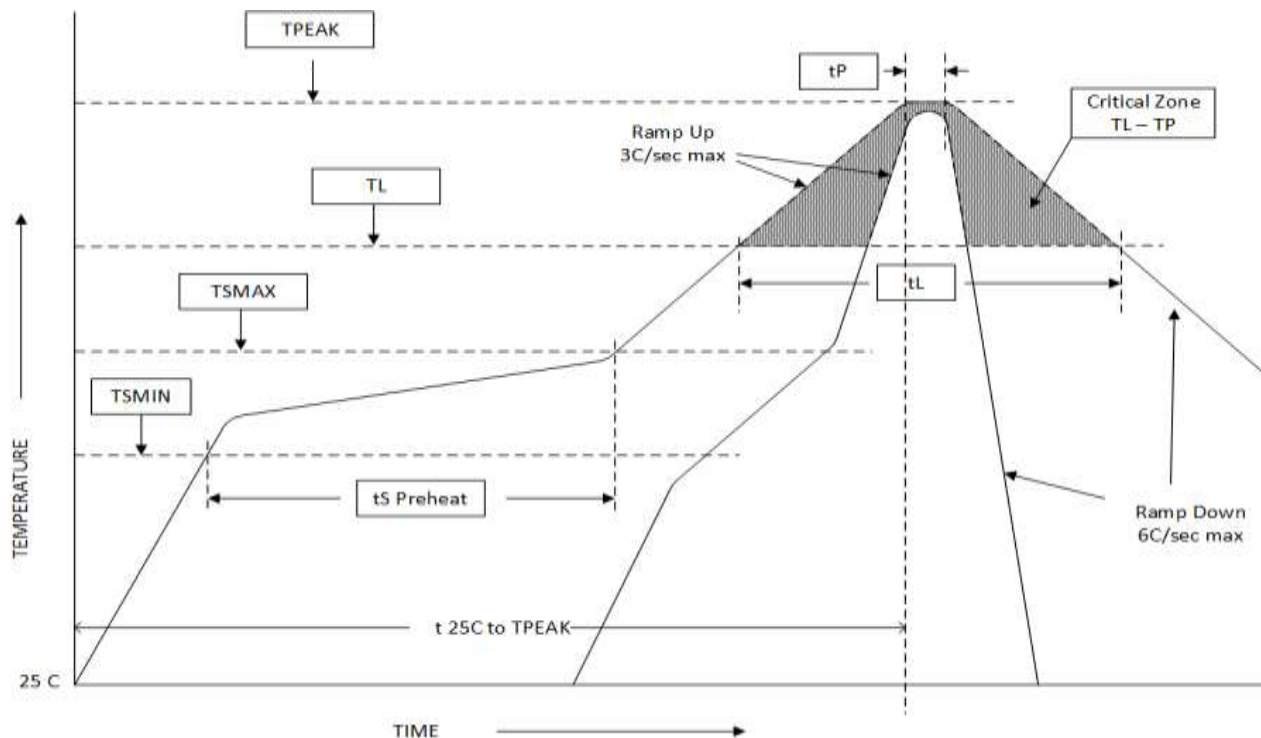


Assembly Instructions

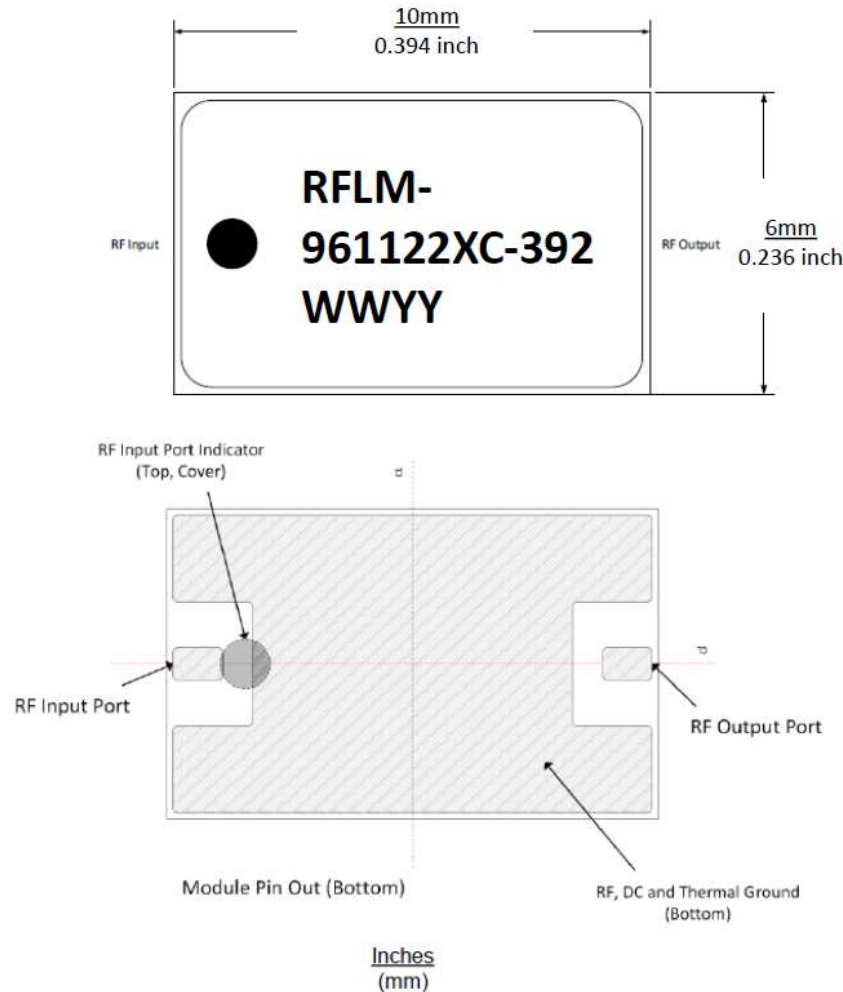
The RFLM-961122XC-392 may be attached to the printed circuit card using solder reflow procedures using either RoHS or Sn63/ Pb37 type solders per the Table and Temperature Profile Graph shown below:

Profile Parameter	Sn-Pb Assembly Technique	RoHS Assembly Technique
Average ramp-up rate (T_L to T_P)	3°C/sec (max)	3°C/sec (max)
Preheat		
Temp Min (T_{smin})	100°C	100°C
Temp Max (T_{smax})	150°C	150°C
Time (min to max) (t_s)	60 – 120 sec	60 – 180 sec
T_{smax} to T_L		
Ramp up Rate		3°C/sec (max)
Peak Temp (T_P)	225°C +0°C / -5°C	260°C +0°C / -5°C
Time within 5°C of Actual Peak Temp (T_P)	10 to 30 sec	20 to 40 sec
Time Maintained Above:		
Temp (T_L)	183°C	217°C
Time (t_L)	60 to 150 sec	60 to 150 sec
Ramp Down Rate	6°C/sec (max)	6°C/sec (max)
Time 25°C to T_P	6 minutes (max)	8 minutes (max)

Solder Re-Flow Time-Temperature Profile



RFLM-961122XC-392 Limiter Module Foot Print Drawing



Notes:

- 1) Plain surface is the RF, DC and Thermal ground. In user's end application this surface temperature must be managed to meet the power handling requirements.
- 2) Back side metallization is thin Au termination plating to combat Au embrittlement (Au plated over Cu).
- 3) Unit = mils

Thermal Design Considerations:

The design of the RFLM-961122XC-392 Limiter Module permits the maximum efficiency in thermal management of the PIN Diodes while maintaining extremely high reliability. Optimum Limiter performance and reliability of the device can be achieved by the maintaining the base ground surface temperature of less than +55°C.

There must be a minimal thermal and electrical resistance between the limiter module and ground. Adequate thermal management is required to maintain a T_{jc} at less than +175°C and thereby avoid adversely affecting the semiconductor reliability. Special care must be taken to assure that minimal voiding occurs in the solder connection to the PCB.

Part Number Ordering Detail:

The RFLM-961122XC-392 Limiter Module is available in the following shipping formats:

Part Number	Description	Packaging
RFLM-961122XC-392	IFF Band Limiter - Input & Output DC Blocking Caps	Gel Pak